Runoff Management System (No. and acre)

Definition

A system for controlling excess runoff caused by construction operations at development sites, changes in land use, or other land disturbances.

Scope

This standard applies to the planning, design, installation, operation, and maintenance of runoff management systems, including adequate outlet facilities and components required for adequate management of storm runoff, as determined by site conditions.

Purpose

Mainly to regulate the rate and amount of runoff and sediment from development sites during and after construction operations to minimize such undesirable effects as flooding, erosion, and sedimentation.

Conditions where practice applies

This practice applies if there is a need to control runoff, erosion, and sedimentation to compensate for increased peak discharges and erosion resulting from construction operations at development sites or from other changes in land use. The discharges may be caused by such factors as increased runoff, reduced time of concentration, or reduced natural storage.

Planning considerations

Water Quantity

1. Effects of onsite detention on decreased runoff volume and peak flow, potentially increased infiltration, and the effectiveness of infiltration devices and controlled outlets.

2. Potential changes in evaportranspiration of vegetation in the infiltration areas and changes in soil moisture storage and volume of deep percolation.

Water Quality

1. Effects of reduction in erosion and sediment yield, with reductions in construction related pollutants adsorbed on sediments, such as fuels and oils.

2. Effects of increases in dissolved nutrients and other chemicals through increased infiltration and deep percolation.

3. Effects on the visual quality of decreased sediment in downstream water resources.

Design criteria

Overall. A runoff management system must be compatible with the flood plain management program of the local jurisdiction and with local regulations for controlling sediment, erosion, and runoff.

The system, a single component or a combination of components, must properly regulate storm discharges from a site to a safe, adequate outlet. Consideration shall be given to the duration of flow as well as the peak discharge. Adequate erosion-control measures and other water-quality practices must be provided. The components must be planned and designed to insure minimal impact on visual quality and human enjoyment of the landscape. Structures and materials must harmonize with surrounding areas.

The peak discharge from the 2-year and 100-year, 24-hour storms shall be analyzed. No increase in peak from these storms shall be allowed unless downstream increases are compatible with the overall flood plain management system.

Components. Components include but are not limited to dams, excavated ponds, infiltration trenches, parking lot storage, rooftop storage, and underground tanks.

Each component shall be designed according to sound engineering principles to insure that the system achieves its intended purpose. Design criteria for individual components shall be based on the following:

1. Dams shall meet the requirements, specified in 40 - part 520, subpart C of the National Engineering Manual.

2. Excavated ponds shall meet the requirements specified for ponds (378).

3. The design of infiltration trenches shall be based on such factors as soil permeability, soil depth, seepage, quality of water to be temporarily stored, foundations for adjacent buildings and structures, drainage conditions, and vegetation. Other considerations are:

a. Only relatively clean water shall enter the trench to insure that oils, grease, and sediments do not seal trench walls and bottom and thus reduce the effectiveness of the practice. At parking lots and at other areas having a similar contamination potential, filter strips; sediment traps; grease traps or filter traps, or both, shall be installed to remove objectionable materials from the water before it reaches the infiltration device. A strip of close growing grasses at least 25 ft wide must be properly placed and maintained to insure the effectiveness of the trench. Water must move through the grass as sheet flow. If local site conditions warrant, a wider filter strip can be used.

b. Trenches shall be located above the seasonally high water table.

c. The size of the trench shall depend on the volume of storage required and the void ratio of the stones in the excavation. The volume of water infiltrating the walls and bottom of the trench during a storm shall be assumed to be zero in calculating the required volume. The permeability rate of the soil is used in determining the dewatering time, which shall not exceed 5 days.

d. The soils used for installing an infiltration trench must be well drained. If permeability of the surrounding soils is less than about 0.6 in./h, suitability of the site for an infiltration trench may not be practicable.

e. An infiltration trench must not adversely affect nearby foundations for buildings, roads, and parking lots and must not impair the growth of significant woody vegetation.

f. Stone used in the excavation must be poorly graded and about 1 to 2 in. in size.

g. In areas where spring runoff from snowmelt is likely to occur before the trench thaws, provisions shall be made for removing the excess water.

h. Provisions shall be made to insure that salts or other soluble pollutants entering the trench do not contaminate local water supplies.

i. The trench bottom and the stone surface must be level to insure adequate storage capacity and uniform infiltration.

4. Parking lot storage areas can be used to help control runoff from impervious paving. Most parking lot storage areas include small ponding areas that have an increased curb height and an outlet control structure. The following factors shall be considered in designing these areas:

a. This practice generally is used to control runoff from areas less than 3 acres in size.

b. The parking lot design and installation grades must insure positive flow to the storage area. The storage area must be nearly level but the slope must be steep enough to facilitate drainage.

c. Trash guards must be provided to prevent clogging of the outlet control device.

d. Generally, ponding on the parking lot must not exceed 6 in. in areas where cars and light trucks are to be parked or 10 in. where heavy trucks are to be parked.

e. Emergency overflow outlets must be provided.

f. Such auxiliary practices as porous pavement and vegetative strips may be used in or adjacent to parking lots to permit infiltration.

5. For rooftop storage, the following requirements are applicable:

a. The roof shall be structurally capable of holding detained storm water and of withstanding the effects of high winds and snow. Requirements for structural stability are outside the scope of this standard and shall be determined by the building designer.

b. An adequate number of roof drains shall be provided.

c. Emergency overflow measures shall be provided to prevent overloading if roof drains become plugged.

d. Detention rings shall be placed around all roof drains in areas to be used for storage. The required number of holes or the size of openings in the rings shall be computed on the basis of the area of roof drainage per detention ring and the runoff criteria.

e. Maximum time of storage on the roof shall not exceed 24 hours.

6. The design of underground tanks shall be based on the following criteria:

a. The tank must be structurally capable of handling the anticipated loadings and be suited to the soils. Requirements for structural stability are outside the scope of this standard and must be based on sound engineering principles.

b. The outlet from the tank shall not be less than 5 in. in diameter. Provisions shall be made to prevent debris from entering the tank. Debris collectors shall be placed so that the need for maintenance can be readily detected and cleaning operations easily performed.

c. The bottom of the tank shall be on a slight grade to insure complete drainage of the tank.

d. Access must be provided to the tank to permit removal of sediment and other debris.

e. The maximum time of storage shall not exceed 5 days.

Sequence of installation. Components shall be designed and installed in a sequence that permits each to function as intended without causing a hazard. Single components shall not be installed until plans for the entire runoff management system are completed.

Safety. Appropriate safety features and devices shall be installed to protect humans and animals from such accidents as falling or drowning. Temporary fencing can be used until barrier plantings are established. Such protective measures as guardrails and fences shall be used on spillways and impoundments as needed.

Visual resource. Landscape architectural practices must insure that all measures are visually compatible with the surrounding landscape.

Protection. A protective cover of grasses shall be established on exposed surfaces and other disturbed areas. Other protective measures, such as mulches, also can be used. Seedbed preparation. seeding, fertilizing, and mulching shall comply with recommendations in technical guides for the area.

Operation and maintenance. A plan of operation and maintenance shall be prepared for use by the owner or others responsible for the system to insure that each component functions properly. This plan shall provide requirements for inspection, operation, and maintenance of individual components, including outlets. It shall be prepared before the system is installed and shall specify who is responsible for maintenance. Adequate rights-of-way must be provided for maintenance access.

Plans and specifications

Plans and specifications for runoff management systems shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.